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The Genus *Euparagia* Cresson (Hymenoptera: Vespidae; Euparagiinae)

JAMES M. CARPENTER¹ AND LYNN S. KIMSEY²

ABSTRACT

A new species of the wasp genus *Euparagia* Cresson, 1879, is described: *unidentata* Carpenter and Kimsey. The phylogenetic relationships of this and the other species in the genus are analyzed cladistically. A key to and catalog of the species are provided.

INTRODUCTION

The genus *Euparagia* comprises nine hitherto described species from the southwestern Nearctic Region. It is the only extant genus placed in the subfamily Euparagiinae, but Cretaceous fossils have been described in an extinct genus, *Curiosivespa*, from Central Asia (Rasnitsyn, 1975; Carpenter and Rasnitsyn, 1990) and southern Africa (Brothers, 1992). In addition to being of great antiquity, the subfamily is the sister group of other extant Vespidae (Carpenter, 1981; Carpenter and Rasnitsyn, 1990). The majority of the species of *Euparagia* inhabit arid regions, and that is also the case for the new species described herein. The present work also provides the first phylogenetic analysis of relationships among species of the genus.

TAXONOMIC BACKGROUND

Euparagia was described by Cresson (1879) as monotypic for the new species *E. scutellaris*, from Nevada. He considered this genus as “probably” belonging to the Masarinae. A second species, *maculiceps*, was described from Mexico in the new, monotypic genus *Plesiomasaris* by Cameron (1904); Cameron (1905) redescribed this species in the eumenine genus *Odynerus*, as *O. simplicipes*. A third species was described from New Mexico by Rohwer (1909) as questionably in the eumenine genus *Psiloglossa*, as *P. simplicipes*. When Bradley (1922) established the generic synonymy of *Plesiomasaris* with *Euparagia*, he misidentified *E. maculiceps*, using it for *P. simplicipes* Rohwer. Bohart (1938) described another species, *platiniceps*, from California,

¹ Division of Invertebrate, Zoology, American Museum of Natural History (carpente@amnh.org).

² Department of Entomology, University of California (lskimsey@ucdavis.edu).

and Bohart (1948) described three more: *boregoensis*, from California; *desertorum*, from California; and *timberlakei*, from California, Nevada, and Arizona. Richards (1962) pointed out that *E. maculiceps* (Cameron) was different from the sense used by Bradley and Bohart, and Bohart (1979) provided the new name *richardsi* for *simplicipes* Rohwer, which was preoccupied in *Euparagia* by Cameron. Bohart (1989) most recently revised the genus, describing two more species: *siccata*, from California and Arizona; and *yuma*, from Arizona.

SYSTEMATICS

The distinctiveness of *Euparagia* with respect to other Masarinae soon led to its placement in a tribe Euparagiini in the Masaridae (Ashmead, 1902), and Bequaert (1918) elevated this to a subfamily of Vespidae. Bradley (1922) considered that *Euparagia* showed more primitive characters in wing venation than other Vespidae, e. g., stating: “In this respect, as in others, *Euparagia* stands out alone as ancestral. . .” (Bradley, 1922: 373).

Richards (1962), however, when reviving multiple families for Vespidae s. l., placed Euparagiinae as a subfamily of Masaridae, and his dendrogram showed it as more closely related to Masarinae than Gayellinae, the other two subfamilies in Masaridae. The first application of cladistic analysis to higher-level relationships within Vespidae by Carpenter (1982) confirmed Bradley’s assessment, and this was corroborated when fossil data were added (Carpenter and Rasnitsyn, 1990). Recently, Hines et al. (2007) published a molecular analysis that showed Euparagiinae not as sister group to the other Vespidae, but rather as closely related to Masarinae. However, their analysis is deficient in many respects, notably in failing to consider all previously published data, and reanalysis of their data (Pickett and Carpenter, in prep.) confirms the relationships established by Carpenter (1982), as do new molecular data.

PHYLOGENETIC ANALYSIS

Specimens examined are housed in the collections of the American Museum of

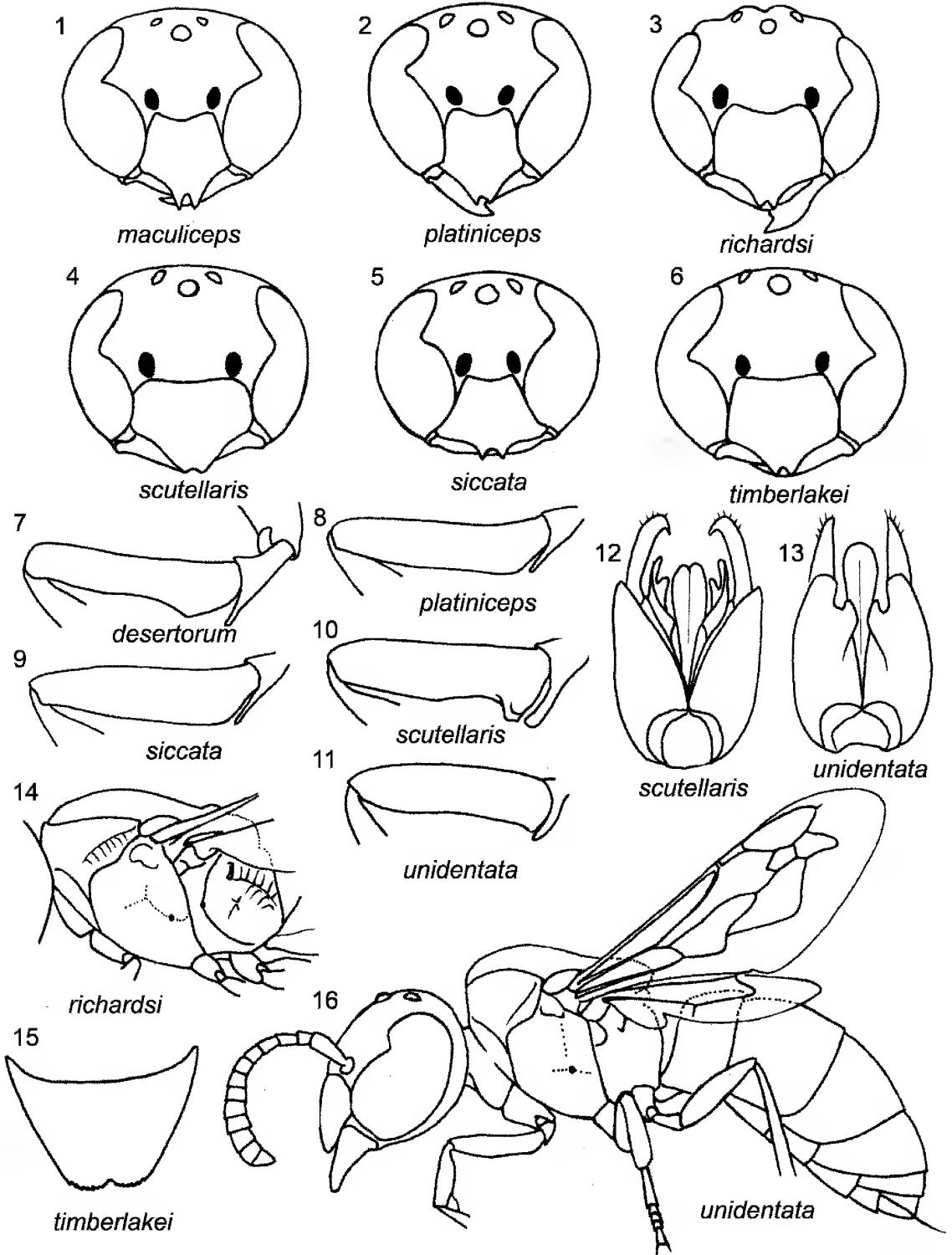
TABLE 1
Character matrix for species of *Euparagia* and *Paramasaris* outgroup. The \$ indicates a subset polymorphism for the states 1 and 2.

Paramasaris	
richardsi	000000000000000000000000000000
boregoensis	01000010012111131111002
desertorum	00000010012111131111\$002
maculiceps	100000101111101110121102
platiniceps	000000100131111110111002
richardsi	00010010112111110221102
scutellaris	00000010012111240111002
siccata	00000020332121120112002
timberlakei	00101110213121100112010
yuma	00000020332121020113000
unidentata	0000002122232120113001

Natural History, the Bohart Museum of the University of California at Davis, the California Department of Food and Agriculture, and the University of California at Riverside. Twenty-three morphological characters were scored in a data matrix for phylogenetic reconstruction (table 1; see character list below). Male genitalia were dissected, cleared slightly in lactophenol, and examined in glycerin. The outgroup is a species of the genus *Paramasaris*, in the tribe Gayellini of the subfamily Masarinae. Cladistic analysis was undertaken using the program TNT (Goloboff et al., 2003). Character editing and tree plotting were accomplished with the program WINCLADA (Nixon, 2002).

CHARACTER LIST

- 1. **Flagellomere I:** shorter than II+III = 0; as long as II+III = 1. This character was mentioned by Richards (1962) as distinguishing *E. maculiceps* from *E. scutellaris*.
- 2. **Terminal flagellomere in male:** conelike = 0; incurved = 1. This was a key character to separate *E. boregoensis* from *E. desertorum* in Bohart (1948, 1989).
- 3. **Male antennal flagellomere IV:** longer than pedicel = 0; about as long as pedicel = 1. This was a key character to distinguish *E. timberlakei* in Bohart (1989).
- 4. **Vertex:** smooth = 0 (figs. 1–2, 4–6); with four tubercles = 1 (fig. 3). The tubercles are in a row, with two of the tubercles behind the lateral ocelli, and two next to



Figs. 1–6. Frontal view of male face. Figs. 7–11. Lateral view of male forefemur. Figs. 12–13. Ventral view of male genital capsule. Fig. 14. Lateral view of thorax. Fig. 15. Ventral view of male SVII. Fig. 16. Lateral view of female.

the compound eyes. The median tubercles were mentioned in the description of *Psiloglossa simplicipes* (now *E. richardsi*) by Rohwer (1909).

5. **Lateral ocellus in female:** separated by more than 1.5 diameter from eye = 0; separated by less than 1.5 diameter from eye = 1. Both this and the next character were key characters to separate *E. timberlakei* in Bohart (1948, 1989).
6. **Lateral ocellus in male:** separated by more than a diameter from eye = 0; separated by less than a diameter from eye = 1.
7. **Female clypeus proportions:** longer than wide = 0; about as wide as long = 1; much wider than long = 2. Additive. The clypeus is about 1.5 X as broad as its median length in state 2. This state was used to key out *E. siccata* in Bohart (1989); he did not mention that it occurs in *E. yuma* as well, although his figure 3 shows it. A very wide female clypeus also occurs in *E. unidentata*, n. sp.
8. **Clypeal apical angles:** narrow, toothlike = 0; broad = 1. Broad apical angles on the clypeus are unique to *E. unidentata*, n. sp. They show sexual dimorphism, straight in the male but concave in the female.
9. **Clypeal emargination in female:** shallow, V-shaped = 0; short notch = 1; shallow, U-shaped = 2; deep, U-shaped = 3. Nonadditive. Bohart (1989) called attention to differences in the shape of the clypeal apical emargination.
10. **Clypeal emargination in male:** shallow = 0; V-shaped = 1 (figs. 1–4); shallow, U-shaped = 2 (fig. 6); deep, U-shaped = 3 (fig. 5). Nonadditive.
11. **Clypeal punctation in female:** few, scattered punctures = 0; densely punctate = 1; densely striatopunctate, macropunctures distinct = 2; densely striatopunctate, macropunctures indistinct = 3. Nonadditive. Differences in clypeal punctation have been used in keys since Bradley (1922).
12. **Female mandible:** quadridentate = 0; bidentate = 1; unidentate = 2. Additive. Bidentate female mandibles are a well known autapomorphy of Euparagiinae (Carpenter, 1981), but *E. unidentata*, n. sp., has the mandible single-toothed in both sexes.
13. **Male mandible:** evenly tridentate = 0; with second tooth reduced = 1; bidentate = 2; unidentate = 3. Additive.
14. **Head capsule venter:** scattered macropunctures = 0; numerous micropunctures = 1; nearly impunctate = 2. Nonadditive. The smooth ventral surface of the head is unique to *E. unidentata*, n. sp.
15. **Male foretrochanter process:** absent = 0; pointed spine = 1 (figs. 7–9, 11); stout, fingerlike = 2 (fig. 10). Nonadditive. As Bohart (1989) pointed out, *E. yuma* is the only species of *Euparagia* without a pencillike process on the foretrochanter. The process is relatively longer in *E. scutellaris* than in the other species.
16. **Male forefemur:** cylindrical = 0; angular = 1 (fig. 8); expanded, rounded = 2 (figs. 9, 11); flattened, broad expansion = 3 (fig. 7); bituberculate = 4 (fig. 10). Nonadditive. Different modifications of the male forefemur have been used in keys since Bohart (1948).
17. **Forefemur emargination in male:** absent = 0 (figs. 8–11); present = 1 (fig. 7). This was referred to by Bohart (1989) in his key as a medial constriction, which distinguishes both *E. boregoensis* and *E. desertorum*.
18. **Pronotal punctation:** large, flat-bottomed punctures = 0; granular-punctate = 1; rugoso-punctate = 2. Nonadditive. Coarser punctation in *E. richardsi* has been used as a key character since Bradley (1922, as *E. maculiceps*).
19. **Pronotal ridges:** absent = 0; lateral furrow with indistinct ridges = 1; lateral furrow crenate = 2 (fig. 14). Additive. Richards (1962: 51) mentioned “much stronger cross-keels” as distinguishing *E. maculiceps* from *E. scutellaris*; the state is also found in *E. richardsi*.
20. **Female scutal punctation:** dense macropunctures = 0; dense micropunctures = 1; narrow mesal zone with few punctures = 2; few punctures throughout = 3. Nonadditive. Previous treatments have not mentioned differences among the species in the scutal sculpture. Both *E. yuma* and *E. unidentata*, n. sp., have only

a few scattered punctures on the female scutum. A different state is seen in *E. siccata* and *E. timberlakei*, where there is mesally a somewhat ill-defined zone with a few punctures. A similar state is also found in some specimens of *E. desertorum*, where the zone is if anything clearer. The sculpture is sexually dimorphic: males in all species have the punctation uniform.

21. **Propodeum:** smooth = 0 (fig. 16); ridged behind spiracle = 1 (fig. 14). There are several strong ridges on the dorsal angles of the propodeum in *E. maculiceps* and *E. richardsi*, as noted by Bradley (1922) and Richards (1962).
22. **Male seventh metasomal sternum (SVII) apex:** rounded to straight = 0; emarginate = 1 (fig. 15). The slight emargination in *E. timberlakei* was mentioned in the description by Bohart (1948).
23. **Parameral spines:** straight = 0; slightly bent apically = 1 (fig. 13); hooked apically = 2 (fig. 12). Nonadditive. Differences among the species in the genus *Euparagia* have not been reported previously.

RESULTS

Exact analysis of the matrix by implicit enumeration resulted in a single cladogram of length 47, consistency index 0.87 and retention index 0.73 (fig. 17). The same cladogram resulted from implied weighting (concavity constant 2, 3, 4 or 5).

The cladogram of figure 17 is not completely resolved, but supports the recognition of two species groups within *Euparagia*, which are each other's sister group. These we term the *scutellaris* group and the *timberlakei* group. The *scutellaris* group is supported by the male forefemur becoming angular (character 16, state 1; fig. 8) and the parameral spines becoming hooked (character 23, state 2; fig. 12; convergent in *E. siccata*). Within the *scutellaris* group, *E. boregoensis* and *E. desertorum* are supported as sister groups by the male forefemur flattened with a broad expansion (character 16, state 3; fig. 7) and with an emargination (character 17, state 1; fig. 7). *Euparagia maculiceps* and *E. richardsi* are

supported as sister groups by the female clypeal emargination being a short notch (character 9, state 1), the pronotum with the lateral furrow crenate (character 19, state 2; fig. 14) and the propodeum ridged behind the spiracle (character 20, state 1; fig. 14). The *timberlakei* group is supported by the female clypeal emargination becoming shallowly U-shaped (character 9, state 2) and the male mandible becoming bidentate (character 13, state 2). Within this group, the new species *E. unidentata*, *E. siccata*, and *E. yuma* form a clade, supported by the female clypeus being much wider than long (character 7, state 2) and the male forefemur expanded and rounded (character 16, state 2; figs. 9, 11). *Euparagia siccata* and *E. yuma* are supported as sister groups in figure 17 by the female clypeal emargination becoming deeply U-shaped (character 9, state 3).

KEY TO SPECIES

1. Vertex with four tubercles (fig. 3).
 *richardsi* Bohart
- Vertex without tubercles (figs. 1–2, 4–6). 2
2. Mandible unidentate; clypeus with apical angles broad; head nearly impunctate ventrally. *unidentata*, n. sp.
- Mandible bidentate or tridentate; clypeus with apical angles narrow, toothlike; head punctate ventrally. 3
3. Lateral ocellus close to eyes: separated by 1.5× its diameter from eye in female, and less than one diameter in male; male SVII emarginate apically (fig. 15). *timberlakei* Bohart
- Lateral ocellus separated by much more than one diameter from eye in both sexes; male SVII not emarginate apically. 4
4. Clypeal emargination deep, U-shaped (fig. 5). 5
- Clypeal emargination different: a shallow notch or deeply V-shaped. 6
5. Propodeum black, mesosoma usually without red markings laterally; male foretrochanter with long spinelike process (fig. 9).
 *siccata* Bohart
- Propodeum and mesosoma extensively light reddish; male foretrochanter without spine-like process. *yuma* Bohart
6. Propodeum all black; metasomal terga without red markings. 7
- Propodeum at least tinged with red; some metasomal terga with red markings. 8
7. Flagellomere I as long as II+III (female) or longer (male); propodeum with several strong

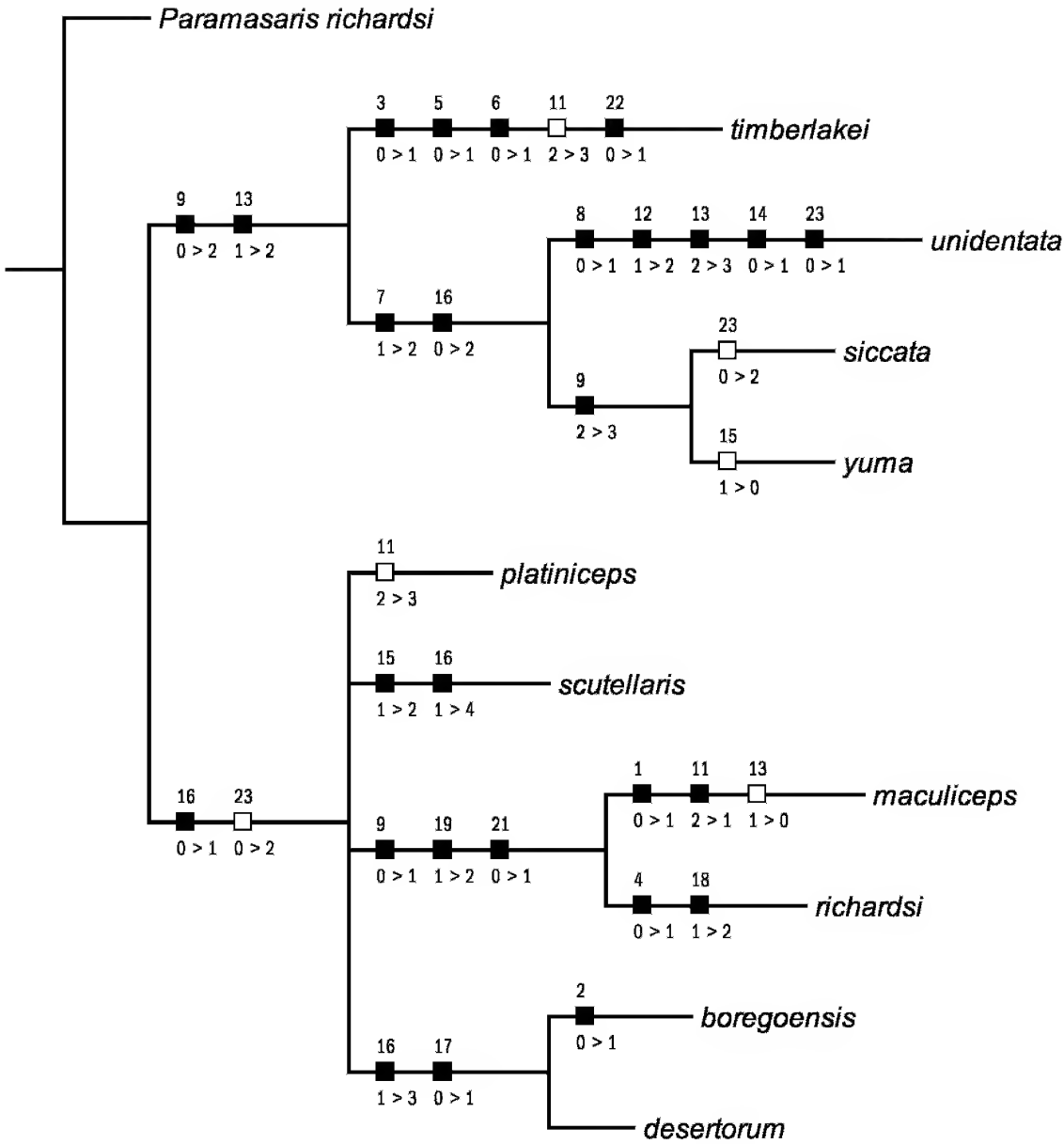


Fig. 17. Character numbers (see list in text) are placed above hash marks, with the state numbers below, separated by ">" to indicate the transitions between states. Filled hash marks indicate an uncontroverted step, while open hash marks indicate homoplastic change. Only unambiguous optimizations are plotted.

- ridges behind spiracle (fig. 14); pronotum strongly ridged in lateral furrow (fig. 14); male forefemur beneath slightly angular basally, without projection.
..... *maculiceps* (Cameron)
- Flagellomere I shorter than II+III; propodeum without ridges; pronotum weakly cristate in lateral furrow; male forefemur beneath with bituberculate basal projection (fig. 10).
..... *scutellaris* Cresson
- 8. Male forefemur beneath slightly angular, not emarginate (fig. 8); female clypeus densely striatopunctate with indistinct macropunctures; female with propodeum dark, and limited dark red markings on metasomal terga. *platiniceps* Bohart

- Male forefemur beneath with flattened basal expansion, slightly emarginate distal to this (fig. 7); female clypeus densely striatopunctate with distinct macropunctures; female with propodeum extensively red, metasomal markings either limited to TI or terga extensively pale red. 9
- 9. Red markings on metasomal terga restricted to I; antennal flagellum mostly dark, light reddish beneath in female; male antennae with apical flagellomere incurved in profile. *boregoensis* Bohart
- Metasomal terga largely light red; antennal flagellum mostly light reddish; male antennae with apical flagellomere not incurved. *desertorum* Bohart

TAXONOMY

Under each species account a complete catalog to the literature is given. For each species, the pagination of the original description is cited, using the original combination, followed by the sex of the specimens. The locality given in the original description is then quoted. The type depository then follows, using these designations for collections: Davis = University of California at Davis; London = Natural History Museum; Philadelphia = Academy of Natural Sciences; San Francisco = California Academy of Sciences. Previous citations of the species are then listed in chronological order. Subsequent combinations are listed separately. A summary of the known distribution follows.

Genus *Euparagia* Cresson

Euparagia Cresson, 1879: vi, genus.

Type species: *Euparagia scutellaris* Cresson, 1879, by monotypy.

Plesiomasaris Cameron, 1904: 266, genus.

Type species: *Plesiomasaris maculiceps* Cameron, 1904, by monotypy.

SCUTELLARIS GROUP

boregoensis Bohart

Euparagia boregoensis Bohart, 1948: 149 (key), 152, male, female - "BOREGO VALLEY, SAN DIEGO CO., CALIFORNIA" [now Borrego] (holotype male San Francisco, no. 5996); 1951:

883 (cat.). - Krombein, 1979: 1470 (cat.). - Bohart, 1989: 462 (key), 463, figs. 1, 4, 10 (AZ, CA).

DISTRIBUTION: U.S.A.: CA, AZ.

desertorum Bohart

Euparagia desertorum Bohart, 1948: 149 (key), 151, male, female - "1000 PALMS, SAN BERNARDINO CO., CALIFORNIA" (holotype male San Francisco, no. 5995); also from two other localities in CA; 1951: 883 (cat.). - Krombein, 1979: 1470 (cat.). - Bohart, 1989: 462 (key), 464 (type locality stated to be in Riverside Co; CA, AZ, NV; Mexico: Baja California). - Rodríguez-Palafox, 1996: 479 (list).

DISTRIBUTION: U.S.A.: CA, NV, AZ; Mexico: Baja California.

maculiceps (Cameron)

Plesiomasaris maculiceps Cameron, 1904: 267, male - "Mexico" (lectotype London). - Meade-Waldo and Morley, 1914: 404 (syn.: *Odynerus simplicipes* Cameron; Mexico: Guerrero). - Bohart, 1989: 465 (designation of lectotype).

Odynerus simplicipes Cameron, 1905: 380, male - "Mexico" (London) [junior primary homonym of *Odynerus simplicipes* (Herrich-Schaeffer, 1839)]. - Meade-Waldo, 1910: 101 (does not belong in *Odynerus*). - Meade-Waldo and Morley, 1914: 404 (syn. of *P. maculiceps* Cameron). - Bohart, 1965: 107, 112 (syn. of *E. maculiceps* (Cameron)).

Odynerus vicarius Schulz, 1906: 219 (in subgenus *Epiponus*). Replacement name for *Odynerus simplicipes* Cameron, 1905, non Herrich-Schaeffer, 1839.

Euparagia maculiceps; Richards, 1962: 51, figs. 47–54. - Bohart, 1965: 107, 112 (syn.: *Odynerus simplicipes* Cameron). - Carpenter, 1981: 33 (species examined). - Bohart, 1989: 462 (key), 465, figs. 8, 12 (Mexico: Michoacan). - Rodríguez-Palafox, 1996: 479 (list).

DISTRIBUTION: Mexico: Guerrero, Michoacan.

platiniceps Bohart

Euparagia platiniceps Bohart, 1938: 137 (key), 138, male - "Lone Pine, Inyo County, California" (San Francisco, no. 4693); 1948: 149 (key), 153 (female; CA); 1951: 883 (cat.). - Krombein, 1979: 1470 (cat.). - Bohart, 1989: 462 (key), 465 (CA, AZ).

DISTRIBUTION: U.S.A.: CA, AZ; Mexico: Baja California Sur.

The record for Mexico is new, based on specimens in the collection of the California Department of Food and Agriculture.

richardsi Bohart

Psiloglossa simplicipes Rohwer, 1909: 357, female - "Las Cruces, N. M." (Washington). Junior secondary homonym of *Euparagia simplicipes* (Cameron, 1905).

Euparagia maculiceps; Bradley, 1922: 384. - Bohart, 1938: 137; 1948: 149 (key), 154 (AZ, TX); 1951: 883 (cat.). Misidentification.

Euparagia richardsi Bohart, 1979: 1470 [replacement name for *Psiloglossa simplicipes* Rohwer, 1909, non Cameron, 1905]. - Krombein, 1979: 1470 (cat.). - Carpenter, 1981: 33 (species examined). - Longair, 1985: 318–320 (male behavior; NM). - Bohart, 1989: 462 (key), 465, fig. 13 (AZ, NM, TX; Mexico: Sonora, Chihuahua). - Rodríguez-Palafox: 479 (list). - Hines et al., 2007: 3297 (sequenced).

DISTRIBUTION: U.S.A.: TX, NM, AZ; Mexico: Chihuahua, Sonora. A new record is Mexico: Michoacan.

Longair (1985) reported that males of this species patrol water sources where females come to collect liquid, presumably for use in nest construction as in other solitary Vespidae.

scutellaris Cresson

Euparagia scutellaris Cresson, 1879: vi, female, male - "Nevada" (lectotype female Philadelphia); 1887: 287 (CA). - Dalla Torre, 1894: 2 (cat.); 1904: 4 (cat.). - Cresson, 1916: 105 (designation of lectotype). - Bradley, 1922: 384 (*maculifrons* [!]), 385. - Williams, 1927: 38–39 (nest and prey). - Bohart, 1938: 137 (key), 138 (CA); 1948: 149 (key), 154 (CA); 1951: 883 (cat.). - Richards, 1962: 51. - Clement and Grissell, 1968: 34–37 (nest and prey). - Torchio, 1970: 24–25, figs. 30–33 (larva). - Moore, 1975: 286 (oviposition, sleeping behavior). - Krombein, 1979: 1470 (cat.). - Carpenter, 1981: 33 (species examined). - Johnson, 1985: 261 (ID). - Trostle and Torchio, 1986: 641–647 (nest, prey, oviposition, larval development). - Bohart, 1989: 462 (key), 465, fig. 7 (widespread in nondesert localities of Pacific Coast states).

DISTRIBUTION: U.S.A.: CA, NV, ID, UT; Mexico: Baja California.

The record for Mexico is new, based on specimens in the collection of the California Department of Food and Agriculture.

This is the only species of Euparagiinae for which the nest has been described. It makes shallow burrows in the ground, topped with curved turrets, and the burrows end in one or more cells provisioned with weevil larvae (Williams, 1927; Clement and Grissell, 1968; Torchio, 1970; Moore, 1975; Trostle and

Torchio, 1986). Clement and Grissell (1968) stated that oviposition occurred after provisioning, but Moore (1975) and Trostle and Torchio (1986) showed that this was incorrect, and that *E. scutellaris* oviposits before provisioning, as in all other Vespidae.

TIMBERLAKEI GROUP

siccata Bohart

Euparagia siccata Bohart, 1989: 462 (key), 466, figs. 2, 9, 11, male, female - "18 mi w. Blythe, Riverside Co., California" (holotype male Davis); also from two other localities in CA; and AZ.

DISTRIBUTION: U.S.A.: CA, AZ.

timberlakei Bohart

Euparagia timberlakei Bohart, 1948: 149 (key), 150, male, female - "6 miles west of PANAMINT SPRINGS, INYO CO., CALIFORNIA" (holotype male San Francisco, no. 5994); also from three other localities in CA; and AZ; 1951: 883 (cat.). - Krombein, 1979: 1470 (cat.). - Bohart, 1989: 462 (key), 466, figs. 5, 14 (CA, NV, AZ).

DISTRIBUTION: U.S.A.: CA, NV, AZ.

Euparagia unidentata, new species

(Figs. 11, 13, 16)

DIAGNOSIS: This species is distinguished from all other species in the genus by the mandibles being unidentate in both sexes; they are bidentate or tridentate in other species. Other unique characters are the clypeal apical angles broad (narrow and toothlike in other species); the venter of the head capsule nearly impunctate; and the male genitalia with the parameral spines bent (either straight or hooked in other species). It is one of the smallest species in the genus, with a body length of about 4 mm.

DESCRIPTION: **Female:** Forewing length 2.8 mm; not longitudinally plaited; first discal cell longer than submedian cell; basal cell apically subtruncate; cu-a diverges slightly distad of fork of M and CuA, is curved and has length > 0.3 length of M; subdiscal cell produced dorsoapically; three submarginal cells; basal angle of first submarginal cell broad; RS vertical beneath prestigma; RS length section below prestigma short; second

submarginal cell narrowed above; m-cu2 placed close to r-m2; basal angle of second submarginal cell acute, M and RS angled; third submarginal cell apically rounded; r-m3 gently curved; recurrent veins received in second and third submarginal cells; first recurrent vein angled sharply into second submarginal cell; prestigma shorter than pterostigma; pterostigma truncate anteriorly; marginal cell angled away from wing margin, with slight trace of appendix; Rs angled near middle of marginal cell; preaxillary excision absent. Hindwing cell number three; subbasal cell broadest apically; jugal lobe long; axillary incision shallow; cu-a transverse; CuA diverging at cu-a; free abscissa of A present; preaxillary excision absent. Antennal articles 12; flagellomere I shorter than II+III, less than half length of scape; vertex without tubercles; eyes without bristles; ocellar-eye distance less than distance between posterior ocelli and posterior ocellus separated by more than 1.5 diameters from eye; ocellar triangle very broadly obtuse; ocellar-occipital distance greater than length of ocellar triangle; interantennal space broad; frontoclypeal suture distinct; antennal sockets close to clypeus; clypeus dorsum straight; clypeal proportions much wider than long, apicomedial emargination shallow, U-shaped, apical angles broad and concave, punctation densely striatopunctate, macropunctures distinct; malar space short; gena width widest dorsally; both preoccipital and postocular carinae present; pronotum with anterior and pretegular carinae, not dorsal, in ventral angle crenate, pronotal lateral furrow with indistinct ridges; posterolateral angle of pronotum dorsally produced and forming short lobe above tegula; posterolateral margin of pronotum running nearly vertically above spiracular operculum; pronotal lobe close to tegula; humeri not produced; pronotal punctation granular-punctate; mesopleural basalar area with elongate excavation; mesepisternum anteriorly angular, accommodating legs when folded, strongly bulging and falling sharply posteriorly to pleural suture; mesepimeron strongly bulging; tegula about as broad as long, widest medially, without anterior angle, rim or emargination; scutum with very few scattered punctures; notauli and parapsidal furrows weakly indicated; mesoscutal lamella present adjoining tegula; scutoscuteellar suture crenate; scutellum pointed posteriorly, in

lateral view profile slightly rounded; axillary lobes not separate from scutellum; transcutellar carina running laterally; scutellar crest flat; metapleuron depressed well below level of mesopleuron; endophragmal pit placement well anterior to spiracle; metanotum oriented partly vertically, not crenate; propodeum punctate, short, with spiracle dorsal and lacking processes or carinae, with posterior face slightly depressed; propodeal orifice dorsally broad, with cuticular ridge above orifice continuous; propodeal valvula poorly differentiated, rounded; submarginal carina absent; foretibial calcar slightly curved; forebasitarsus excavated basally opposite calcar, longer than other foretarsal segments; foretarsi symmetrical; mesocoxae contiguous; midfemoral basal ring present; two midtibial spurs; hindcoxa ecarinate; hindtibial calcar absent, second spur very reduced; metasomal segment I sessile, nearly as wide as II; Tergum I widest posteriorly, abruptly expanded basally, declivity angular in lateral view; metasomal Tergum and Sternum I unfused; Tergum II not constricted basally; Terga I–V with translucent lamellae differentiated apically; Sternum II flat with smooth transverse furrow apically; metasomal retraction absent. *Vestiture*: with abundant silvery pubescence, especially thick on frons and mesepisternum, where the sculpture is obscured. *Color*: black; ivory are the clypeus except for brownish red apical rim, most of pronotum, a large anterodorsal spot on mesepisternum, tegula except for a central brownish spot, a large posteromesal spot on scutum, lateral lamellate margins of scutum, scutellum entirely, metanotum medially, most of dorsal surface of Tergum I, Terga II–V laterally and posteriorly, with posterior bands deeply emarginate laterally on Terga II–V, Tergum VI, tibiae, and tarsi exteriorly, spot on forefemur covering about a third of its length, apex of midfemur; flagellum largely pale brown; reddish brown are mandibles, valvulae and rim of propodeal orifice; reddish are tibiae and tarsi interiorly and femora apically on interior and fore- and midfemur on exterior, Terga I–V extensively, Sterna entirely; wings hyaline. *Variation*: the holotype is the darkest specimen; most of the paratypes have the propodeum, metapleuron, pronotum anteriorly, and femora extensively reddish, and Sterna II–IV marked posterolaterally with ivory. One of the female

paratypes has the terminal flagellomeres emarginate, a curious trait that is evidently an aberration.

Male: Antennal articles 13; terminal flagellomere conelike; flagellomere IV longer than pedicel; posterior ocellus separated by more than a diameter from eye; clypeal emargination shallow, U-shaped; foretrochanter process a pointed spine; forefemur expanded, rounded, without emargination; scutum densely micropunctate; metasomal Sternum VII flat, apex rounded. *Color:* same as female, except mandibles and apex of scape ivory, flagellum very pale brown beneath.

TYPE MATERIAL: Holotype female from U.S.A.: California, San Bernardino Co., S side of Kelso Dunes, 19 June 1999 (D. Yanega), on flowers of *Tequilia* [recte *Tiquilia*], labeled with the collection number UCRC ENT 00030506. Paratypes: two males from California, sand dunes east of Brawley, 13 June 1960 (R.C. Dickson), on *Eriogonum deserticola*, labeled with UCRC ENT 71283 and 71284; one male from California, 7 miles west of Glamis, 25 July 1960 (R.C. Dickson), on *Eriogonum deserticola*, labeled with UCRC ENT 71288; four females from California, 2 miles west of Glamis, 25 July 1960 (R. C. Dickson), on *Coldenia plicata*, labeled with UCRC ENT 71285–71287 and 71289; one female from California, Riverside Co., 4 mi. E. of Indio, 6 March 1973 (R.L. Weissberg), labeled with UCRC ENT 71290; one male and one female from California, Imperial Co., W side of Algodones Dunes, 2 miles south of Cahuila Ranger Station, 32°57'12"N 115°09'18"W, 67 m, 3 June 2008 (L. S. Kimsey) *ex Croton*. Holotype and most paratypes in the collection of the University of California at Riverside; one female (UCRC ENT 71285) and one male (71284) paratype in the American Museum of Natural History; paratypes from W side of Algodones Dunes in the Bohart Museum of the University of California at Davis.

yuma Bohart

Euparagia yuma Bohart, 1989: 463 (key), 466, figs. 3, 6, male, female - "18 mi s.e. Parker, Yuma Co., Arizona" (holotype male Davis); also from another locality in AZ.

DISTRIBUTION: U.S.A.: AZ.

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